

animals, such as cattle, pigs, fowls, ducks, &c., are susceptible to plague infection, but extensive experiments made by competent observers in several parts of the world completely agree in opposition to this belief.

In the memorandum the importance of preventing the access of rats to or their entrance into buildings is emphasised. It is pointed out that a cat in the house is a safeguard against domestic invasion by rats and mice, although it must be borne in mind that the cat is in some degree susceptible to plague. Major Buchanan, of the Indian Medical Service, has strongly urged the advisability of stocking the villages in India with cats as a preventive measure, but it must be said that no very definite evidence in support of the proposal has been produced.

With regard to the extermination of rats it is admitted that complete extermination is perhaps impossible. A material diminution in the rat population would undoubtedly lessen the spread of infection amongst them, but the fertility of the rat and the fact that it overruns the whole country in enormous numbers make the task of permanently suppressing the rat community in this country an extremely difficult one. It is certain that only a never-ceasing and complete organisation for rat destruction will appreciably reduce their numbers, and it is perhaps not sufficiently realised by some of the advocates of a general rat campaign that in order to be thorough and effective such a campaign would involve a most extensive and, in the aggregate, a most costly organisation. In this connection the experience of rat destruction gained in Japan is instructive. Kitasato has reported that in five years 4,800,000 rats were killed in *Tokio alone* at a considerable financial outlay, but that at the end of this time no appreciable decrease in the rat population could be detected. Kitasato attributed this to the circumstance that the rate of destruction, vigorous as it was, did not keep pace with the natural increase in the rat population. Recent experience in India appears to point in the same direction.

It is beyond question, however, that so far as plague prevention is concerned a great deal can be done in this country by diminishing or, preferably, abolishing rat infestation in human habitations and in their immediate neighbourhood.

G. F. PETRIE.

#### DR. THEODORE COOKE.

WE announced with regret last week the death, on November 5, of Dr. Theodore Cooke, C.I.E., formerly a member of the Bombay Educational Department. Born at Tramore, co. Waterford, in 1836, Dr. Cooke entered Trinity College, Dublin, where, after a distinguished career as a student, he graduated in 1859 in the faculties of arts and engineering. In the former faculty he was Hebrew prizeman, first honoursman, and senior moderator and gold medallist in science; in the latter he obtained special certificates in mechanics, chemistry, mineralogy, mining, and geology. Pursuing his profession as an engineer, he joined in 1860 the service of the Bombay, Baroda and Central India Railway, then under construction; during this service he built for the company the great iron bridge at Bassein. Five years later the Government of Bombay secured the services of the talented young engineer as principal of the Civil Engineering College, which later with widened scope became the College of Science, at Poona. The post proved congenial to Dr. Cooke; his wide and varied knowledge, with which were associated much tact and great

administrative gifts, enabled him to fill it with signal success until he retired from India in 1893.

Throughout his service Dr. Cooke had taken a keen interest in botanical studies, and field-work connected therewith was one of his chief recreations. What he did as a pastime was, however, characterised by the thoroughness that marked his official work; he soon became a recognised authority on the vegetation of Bombay and Scinde, and it was only fitting that when, in 1891, the Botanical Survey of India was organised, Dr. Cooke should be placed in charge of the survey operations in western India. Encouraged thereto by Sir George King, then director of the survey, Dr. Cooke made preparations for the production of a "Flora of the Presidency of Bombay." Difficulties over which neither Sir George King nor Dr. Cooke had control at first prevented the realisation of the scheme, and when Dr. Cooke retired in 1893 his energies found an outlet in a post to which he was appointed at the Imperial Institute.

The difficulties that had stood in the way of the publication of a local flora of Bombay having at last been overcome, Dr. Cooke was able, some years later, to settle at Kew and commence the preparation of the work in the herbarium there. The first part was published in 1901; the seventh and concluding part appeared about two years ago. The work is marked by the thoroughness and attention to detail characteristic of all that Dr. Cooke did; nothing is taken for granted; every previous statement is carefully verified or refuted; and the "Flora" will remain a lasting memorial to Dr. Cooke's critical acumen, industry, and energy. On its completion Dr. Cooke continued to work in the herbarium with undiminished ardour, assisting as a volunteer in the preparation of the great "Flora Capensis," edited by Sir W. T. Thiselton-Dyer, until laid aside by the illness which has ended his career. Dr. Cooke, on whom his university had already conferred the degree of LL.D., was created a C.I.E. in 1891, and was a Fellow of the Linnean and the Geological Societies.

#### NOTES.

THE Nobel prize for chemistry has been awarded to Prof. Otto Wallach, professor of chemistry in the University of Göttingen.

WE regret to see the announcement of the death, on November 13, of Mr. W. R. Fisher, formerly assistant professor of forestry at Coopers Hill College.

THE Royal Geological Society of Cornwall at its annual meeting at Penzance on November 8 awarded Dr. George J. Hinde, F.R.S., the Bolitho gold medal for his valuable papers and services in connection with the geology of the county.

A REUTER telegram from Pisa states that on November 10, in the presence of King Victor Emmanuel and a Government Commission, Signor Marconi received wireless telegrams direct from Canada and Massowah by means of his extra powerful installation at Coltano.

MR. A. E. BROWN, secretary of the Zoological Society of Philadelphia, has died suddenly of heart disease in his sixty-first year. He was vice-president and curator of the Academy of Natural Sciences in the same city, and a frequent contributor of zoological and biological articles to various scientific journals.

DR. C. WILLARD HAYES, chief geologist to the U.S. Geological Survey, is now visiting Panama by the direction of President Taft to make a preliminary study of

geological formations in the "canal zone," with special reference to the excavations at the Culebra cutting. Upon the results of his investigations will depend the decision whether a geologist will be permanently assigned to assist the canal commission.

A REUTER message from Munich announces the election of the following corresponding members of the Munich Academy of Sciences:—Dr. F. G. Kenyon, director and principal librarian of the British Museum; Dr. L. Fletcher, F.R.S., director of the Natural History Museum, South Kensington; Principal Miers, F.R.S., the University of London; Dr. D. H. Scott, F.R.S.; Profs. Wilson and Osborn, Columbia University, New York.

PRIOR to the anniversary meeting of the Mineralogical Society in the Geological Society's rooms at Burlington House on Tuesday, November 15, Dr. Lazarus Fletcher, F.R.S., was presented with his portrait, painted by Mr. Gerald Festus Kelly, in recognition of the invaluable services he had rendered to the society during the past quarter of a century, the presentation being made by Prof. W. J. Lewis, F.R.S., on behalf of the members and other subscribers. For three years, 1885–8, Dr. Fletcher was president, and for twenty-one years, 1888–1909, general secretary, of the society, and it is to his genial and stimulating influence that its present prosperous condition is largely due. Dr. Fletcher resigned the secretaryship upon his appointment as director of the Natural History Museum.

A CAREFULLY planned effort is being made by the authorities of the American Museum of Natural History in New York to popularise the resources of that institution. On a recent afternoon they gave a reception to from 1500 to 1800 of the school teachers of the city, having invited the principal of each school and two delegates whom he should appoint. The programme of this "Teachers' Day" included a personally conducted tour of the building, an introductory address by the president of the museum, Dr. H. F. Osborn, and six ten-minutes' talks by experts, interspersed by orchestral music, and followed by tea in the ornithological hall. The object of the reception was to show the teachers of New York what the museum had to offer both for themselves and for the children in their classes.

DR. W. H. BREWER, professor emeritus of agriculture at the Sheffield Scientific School of Yale University, has died at New Haven from the infirmities of old age. He was born in 1828. Before his appointment to the Yale chair in 1864 he had been professor of chemistry and geology at Washington College, Pennsylvania, and professor of chemistry in the University of California. He became professor emeritus in 1903. He had served on several important Government commissions, and had been president of the Connecticut Board of Health, of the Connecticut Academy of Sciences, and of the Arctic Club of America. In an editorial note on his career, the *New York Evening Post* describes him as one of the fast disappearing representatives of a stirring type. It quotes from a friend who once spoke of him as an "eminent geologist, an expert mining engineer, an Arctic explorer, an art critic, an author, and a charming companion," and adds that, like Shaler and Holmes, he "was the product of no system other than that prescribed by his own capacity of learning, and perhaps for that very reason possessed a vitality and range which are seen but seldom in the younger generation."

At the annual general meeting of the London Mathematical Society, held on November 11, the following were elected to be the council and officers for the session

1910–11 (the names of members not on the retiring council are printed in italic type):—*President*, Dr. H. F. Baker, F.R.S., *vice-presidents*, Mr. J. E. Campbell, F.R.S., Major P. A. MacMahon, F.R.S., Sir William Niven, K.C.B., F.R.S.; *treasurer*, Sir Joseph Larmor, F.R.S.; *secretaries*, Prof. A. E. H. Love, F.R.S., Mr. J. H. Grace, F.R.S.; *other members of the council*, Mr. G. T. Bennett, Dr. T. J. I'A. Bromwich, F.R.S., Dr. W. Burnside, F.R.S., Mr. E. Cunningham, Mr. A. L. Dixon, Dr. L. N. G. Filon, Dr. E. W. Hobson, F.R.S., Prof. H. M. Macdonald, F.R.S., and Dr. A. E. Western.

VERY great vigour has characterised the conduct of the Tacubaya Observatory of late, and therefore the severe loss the institution has suffered by the death of the director, Dr. F. Valle, will be keenly felt, for he made the observatory a centre for scientific activity throughout all Latin America. Dr. Valle played a foremost part in promoting scientific usefulness and maintaining an efficient standard throughout the Republic of Mexico. The "Annuaire," for which he was mainly responsible, appeared with great regularity, and supplied a mass of information connected with geodesy, meteorology, and physics that would be particularly useful in the society in which it circulated, while the articles on astronomy quickened local and popular scientific effort. But of greater importance in general, and on what the reputation of the late director will rest, was his ardent prosecution of the work of stellar photography in connection with the *Carte du Ciel*, the observatory being responsible for the zone 10°–16° south declination. When the last report was issued, only 22 fields remained to complete the 1200 for the catalogue, and these must have long since been supplied. No fewer than 800 plates had been measured, and the catalogue plates were being actively pushed forward. Such activity contrasts very favourably with the results obtained at some observatories engaged on the southern zones, and the zeal displayed is the more commendable, as it is known Dr. Valle had to contend with very great difficulties in regard to the figure of the object-glass of his photographic refractor. Dr. Valle did not only measure his plates, but he used his meridian circle vigorously for determining the position of standard stars used in the reduction of the photographic plates. Add to this record the work of the observatory in spectroscopy, magnetism, seismology, and meteorology, and it will be admitted that Dr. Valle's energy went far to remove the stigma of indifference and lassitude which at one time was inclined to rest on the observatories of Spanish America.

THE account of the work of the Port Erin Biological Station given by Prof. W. A. Herdman to the Liverpool Biological Society on November 11 shows that the station continues to develop. It is expected that the much needed extensions now in progress will be completed and equipped by Easter of next year. During last summer vacation Prof. Herdman, Dr. Dakin, and Dr. Roaf conducted, for the first time, a valuable course of work in the science of oceanography (including hydrography and planktology). The work consisted partly of lectures and demonstrations in the biological station, partly of collecting and observing work on the seashore, and partly of expeditions at sea in the steam yacht *Ladybird* and in the Lancashire Sea Fisheries steamer. The operations of the fish hatchery at the station have resulted in the hatching and setting free at sea of upwards of 8,000,000 plaice fry and more than 5000 lobster larvæ—a substantial advance upon the work of any previous year. Plankton observations were carried out on the same lines as in the previous three years, three collections being made twice a week in the sea off Port Erin the whole year round. During July Prof. Herdman

took a series of vertical plankton hauls from various deep localities off the west coast of Scotland. A comparison of the collections show (1) that there is a constancy year after year in the nature of the plankton at certain localities, and (2) that some of the localities, not very far apart, differ considerably from one another in the nature of their plankton at the same time of year (July).

THE general committee of the Mansion House fund for providing a memorial to King Edward in London has had under consideration numerous proposals as to the form the memorial should take. The only decision which has as yet been arrived at is that, apart from the provision of a larger memorial of his Majesty, a statue of King Edward VII., with suitable accessories, be erected in some prominent and appropriate position in London, and that a fund be immediately opened for the purpose. Other schemes are still under consideration. Originally 164 proposals were received by the committee, but, according to the daily papers, these have been ruled out, with a few exceptions, as unsuitable or impracticable. The general committee has still to decide finally; but among schemes recommended to them by the executive committee are Lord Esher's proposal for an historical museum in London on the lines of the Musée Carnavalet in Paris. Secondly, the scheme of Lord Avebury for the building of a great hall for the University of London, to be used for degree and ceremonial purposes, and also for examinations. Thirdly, Lord Northcote's suggestion that a portion of the fund should be devoted to a scheme "for the protection of human life in the tropics by a great extension of that campaign against tropical disease which has already abated so largely the sum of human suffering." This last proposal has the support of the Society of Tropical Medicine and Hygiene, and a letter, signed by Prof. Ronald Ross, F.R.S., and other officers of the society, outlining the valuable work for the Empire which could be done by such an endowment of the study and prevention of tropical diseases, appeared in the *Times* of November 5. Lord Rosebery, as Chancellor of London University, has, in a letter to Lord Avebury, expressed his hearty approval of the scheme put forward by Lord Avebury.

ON November 8 Major Sykes delivered an interesting lecture to the Royal Geographical Society describing two short journeys which he took recently in north-eastern Persia the ancient Parthia, and Hyrcania. This district has always been one of special interest to the historian. It formed part of the patrimony of the earliest Persian kings; in it originated both the religion of Zoroaster and the Parthian dynasty, which measured its strength successfully with Rome; it has always been the debatable land on the border between Iran and Turan; and now it seems within measurable distance of falling, finally, into the possession of Russia, without any of the clamour, nay, danger, of war which such an advance of the Muscovite would have caused in England a few years ago. Such are the ways of high politics. The cities of north-eastern Persia are interesting also. Meshhed is a great centre of caravan-routes; ancient Nishapur is renowned as the birthplace and abiding-place of Omar Khayyâm; Turshiz is the traditional town of Zoroaster, where the great prophet converted Vishtâspa the king and planted the sacred cypress; Budjurd and Astrabad are interesting as really Turanian rather than Iranian towns. The dividing line between Hyrcania and Parthia was never drawn definitely. In the inscription of Darius the Great at Bisitûn (Behistun), the lands of "Parthva and Varkana" are mentioned together. The name of Hyrcania (Varkana) survives in that of the modern river Gurgân. Major Sykes had previously visited the valley of the Atrek, in which Budjurd lies. His route

on this journey was taken from Meshhed to Budjurd, thence to Astrabad, and back by way of Shahrud, Subzawar, and Nishapur (the well-known old trade-route) to Meshhed. On the way he made several interesting explorations, and identified some ancient sites, notably that of Paras, which is probably the ancient Parthian capital. On his second journey he went to Nishapur and Turshiz. At Nishapur he identified the sites of several ancient cities which have been built near the spot from the original Niv-Shapur of Sapor I. to the mediæval Nishapur of Omar Khayyâm and the entirely different modern town. At Turshiz Major Sykes also made interesting discoveries.

IN spite of having presented his unrivalled collection to the nation, Lord Walsingham, as evident from a paper on Madeiran Tinerinæ in the November number of the *Entomologist's Monthly Magazine*, continues to devote attention to his favourite Micro-Lepidoptera. Two new species are described in this communication.

WITHERBY'S *British Birds* for November contains a long list of birds marked in the British Isles which have been recently recovered in various places, either at home or abroad. Among the items may be noted a teal marked in Essex in February and taken off Schleswig in August, and a tern ringed in Cumberland in July and captured south of Oporto in September.

IN a paper on the tooth-billed bower-bird (*Scenopæetes denti-rostris*) published in the *Emu* for October Mr. S. W. Jackson states, as the result of continued observation, that, as a rule, during the height of the breeding season these birds do not visit their play-grounds or indulge in mimic vocalisation in the daytime, but reserve the latter performance for the periods before sunrise and after sunset, when they are in the tree-tops. During the nesting season the play-grounds are silent, unoccupied, and, most significant of all, untidy.

To the November number of *Pearson's Magazine* Mr. Walter Brett contributes an appreciative notice of the bird groups mounted in the Natural History Museum at New York. According to the author's own words, the birds in these groups "positively breathe with life. Their pose is natural; their surroundings are true to nature; their throats almost tremble with the song one expects to hear. And the reason of this is that these birds are life studies, scientifically correct as well as artistically perfect. The visitor knows they are stuffed only because he is aware that they are in a museum, not in an aviary." The article is illustrated with reproductions from photographs of several of the groups.

No. 1766 of the Proceedings of the U.S. National Museum is devoted to an account, by Miss Rathbun, of a collection of stalk-eyed crustaceans from the coast of Peru and adjacent parts of South America. The most notable additions to the fauna include a small crab of the genus *Dromidia*—the first of its group from western South America—and *Panopæus bermudensis*, previously known from the Atlantic, while examples of two species hitherto represented by the types were also obtained. A noticeable feature is the abundance of Xanthidæ and Inachidæ and the scarcity of Parthenopidæ and shrimps of all kinds. Many of these Peruvian crustaceans, especially hermit-crabs, are used either as food or for bait.

AT the commencement of a review of the species of venomous toad-fishes of the genera *Thalassophryne* and *Thalassothia*, published as No. 1765 of the Proceedings of the U.S. National Museum, Messrs. Bean and Weed state that these fishes differ from all other members of the class by possessing grooved or perforated spines, analogous to

the fangs of venomous serpents, for introducing the poison they secrete into the bodies of their victims. In a specimen of *Thalassophryne reticulata* examined by the authors the poison-sac was found to occupy the whole length of the under side of the spine. The position of the sac is such that any pressure tending to drive the spine into the skin of another animal would produce a pressure on the sac, and thus inject the poison with considerable force into the wound.

THE ova and larvæ of teleostean fishes taken at Plymouth in the spring and summer of 1909 form the subject of the chief article in the Journal of the Marine Biological Association (October). The work was specially directed to practical questions connected with the fishing industry, such as the location of spawning areas, the duration of the spawning period, and the relative extent of the breeding of various kinds of fishes in the Plymouth area rather than to details of purely biological interest, and accordingly the descriptions of the eggs and larvæ forming the subject of the article bear special reference to the means of ready identification at different stages of development. A striking feature in the collection of pelagic eggs was the overwhelming preponderance of those of non-marketable species, such as rockling, rock-wrasse, boar-fish, and dragonets. It may be assumed, if sufficient samples be taken, that the relative abundance of eggs in the plankton affords a trustworthy index to the proportionate numbers of adult fish at the spawning season, and it may therefore be expected that in inshore areas such eggs should be largely those of rockling and wrasse. But this does not explain the predominance of dragonets, boar-fish, &c., over whittings, dabs, plaice, and soles. Although the latter are the objects of attention on the part of trawlers, it is still an open question to what extent the present state of affairs may be attributed to trawling.

In the *Biologisches Centralblatt* (October 15) is published the first portion of an article, by Prof. K. Goebel, on sexual dimorphism in plants, discussing the extent to which dioecious plants are modified apart from the sexual organs. Examples of specific differences in seed plants are rare. *Cannabis sativa* is often quoted as a good example, although the author doubts if there is much distinction in a præfloral stage; he also questions whether it is possible to distinguish staminate and pistillate specimens of *Cycas*, *Taxus*, and *Juniperus* when not in flower. Amongst cryptogams better examples occur, notably in the case of such liverworts as *Symphyogyne leptothele*, which is figured. The fundamental reason for the differences lies in the necessity for providing more nourishment for the products of the egg cell, and this also explains the positions of the sexual organs in monoecious plants.

THE current number of *Tropical Life* (No. 9, vol. vi.) contains several articles on cotton cultivation both in the British Empire and the United States. In Egypt, Mr. Foaden points out, cotton occupies from one-half to one-third of the total acreage of cultivated land in those provinces where the conditions are suited to its growth, while the value of the crop is from 25,000,000l. to 30,000,000l. annually. Unfortunately, there has been a gradual fall in yield per acre during the past few years, the cause of which has been variously attributed to a rise in the subsoil water brought about by increased irrigation, to an increase in insect pests, and to soil exhaustion. Though the fertility of the Nile Valley is proverbial, the soils are usually deficient in nitrogen; crops show remarkable increases when nitrate of soda is applied or when a crop of clover—berseem—is ploughed in.

IN the current number of the *Fortnightly Review* Mr. J. Saxon Mills writes on the production of sugar from sugar beet, which he regards as one of the most hopeful schemes yet suggested for the benefit of rural districts. All the arguments in favour of the crop are set out concisely, and some very persuasive statistics are given. Field trials in Lincolnshire, Suffolk, Essex, and at Newnham Paddox have shown that crops varying from 15 to 20 tons per acre can be obtained containing 16 to 18 per cent. of sugar, while the Continental crops are lower both in quantity and in sugar content. Indeed, sugar beet is actually grown on a commercial scale in parts of the eastern counties, but is shipped to Holland to be worked up in the Dutch factories. It is contended that factories would prove highly advantageous in English country districts, and would also prove a remunerative investment. As several factories are already being started in England, it ought not to be long before very definite information is forthcoming on this question.

THE report on the Experiment Station, Tortola, Virgin Islands, for 1909-10, is to hand, and records certain improvements and additions to the station in connection with the sugar and cotton work and the water supply. The export trade in sweet potatoes and limes shows signs of increasing, while it has also been shown that a limited quantity of cacao could be produced for export. The cotton industry received a check owing partly to a fall in price and partly to bad weather; early planting is recommended as an improvement in cultivation. The report on the Botanic Station, Agricultural School and Experimental Plots, St. Lucia, 1909-10, shows that continued and steady progress is being made. During the year no fewer than 77,557 plants were sent out for distribution from the station, against 43,492 for the previous year. A scheme for prize-holdings competitions has been introduced, and will, it is hoped, raise the general level of cultivation.

IN a paper read at the November evening meeting of the Pharmaceutical Society, Prof. H. G. Greenish and Miss D. M. Braithwaite described a method by which the presence of the drug-room beetle (*Sitodrepa panicea*) may be readily detected in powdered drugs. The quantity of beetle present in an infested drug is so small that its direct examination under the microscope is practically impossible, and it is therefore necessary to separate the particles of insect from the drug before they can be observed. The process of separation devised by the authors is dependent upon the fact that the hardened parts of the mature beetle are of such a highly chitinous character and so extremely resistant to the action of acids, alkalies, and oxidising mixtures that it is possible to destroy the organic matter of the powdered drug without destroying the beetle. It is possible by means of the process described to detect particles of beetle in a powdered drug containing 0.00001 gm. of beetle in 5 gms. of powder. By the use of this method it can be shown whether a powdered drug is prepared from "worm-eaten" or sound material. In the course of their investigations the authors found that while the larvæ of the beetles undoubtedly ingest considerable quantities of starch, only a small proportion of this appears to be digested. It seems probable that the substances chiefly utilised as nutriment by the larvæ are not carbohydrates, but nitrogenous substances, such as the remains of protoplasm, &c.

BLACKHEAD is a highly infectious disease of turkeys prevalent wherever they are domesticated, and causes great financial loss each year. The symptoms are voluntary isolation, stupor, loss of appetite, drooping of the wings,

and emaciation; the disease is characterised by pathological changes in the cæca, intestines, and liver, while there are invariably present in the organs encysted stages of a coccidium, and also an amoeba known as *A. meleagridis*. In a long Bulletin issued by the Agricultural Experiment Station of the Rhode Island State College Drs. Cole and Hadley give a detailed summary of the work so far done on the disease, and add a number of observations of their own. Although but little advance is recorded in the methods of prevention and treatment, the bulletin will be found very useful to those interested in diseases of birds, both by reason of its completeness and for the evidence it offers that the cause is a coccidium.

THE United States laws dealing with commercial fertilisers go further than our own in that they require the name of the firm to be published along with the analytical data dealing with the manures and feeding-stuffs supplied. Bulletin 141 of the Purdue University Agricultural Experiment Station gives the results of analysis of several hundred fertilisers and feeding-stuffs, together with the guarantee and the name and address of the manufacturer. Any case of fraud is thus at once exposed. The law is fully explained in the bulletin, and several illustrative cases are quoted. There are also tables showing the average composition of normal feeding-stuffs, and of the materials used as adulterants. Altogether, the bulletin gives a very good idea of the work of an agricultural analyst in the United States. A smaller bulletin on the same lines is sent us by the West Virginia University Agricultural Experiment Station.

In one of a series of papers on the foraminifera of the shore-sands of Selsey Bill, Sussex, Messrs. E. Heron-Allen and A. Earland have described the forms derived from Cretaceous sources (Journ. R. Microscopical Soc., 1910, p. 401). In all cases these have been compared with specimens obtained from the hollows of flints in the same deposits; 118 species are identified, some of which are new to the records from the Upper Chalk. Mr. Heron-Allen offers a copy of a privately issued paper on Chalk foraminifera, printed in 1894, to any worker who may apply for it (address: Large Acres, Selsey). This earlier paper contains complete directions as to preparing material from the Chalk, as well as records of a number of species found at Twyford, many of which were previously known only in Cainozoic strata. It is pleasant to see that the veteran Mr. Joseph Wright, of Belfast, remains an active adviser on the work published in 1910.

COPIES have reached us of the valuable meteorological charts of the North Atlantic and North Pacific Oceans for December, and of the South Atlantic and South Pacific for the season December, 1910 to February, 1911, issued by the U.S. Weather Bureau. In the North Atlantic chart Prof. Moore continues the useful practice of exhibiting, by daily synoptic weather charts, specimens of the typical cyclonic storms which occur in that month. One of these disturbances, which was central near the Azores on December 18, 1909, moved quickly across Great Britain to the North Sea. The synchronous chart of December 21 shows that another storm dominated the entire northern part of the ocean, that typical cyclonic circulation prevailed from the American to the European continent, and that its disturbing influence was felt so far south as Madeira.

AN interesting application of the dilatometric method to the study of the polymorphism of the alkali nitrates is described by Prof. Bellati and Dr. Tinazzi in the *Atti del Reale Istituto Veneto*. It is shown that ammonium

nitrate undergoes an abrupt expansion at 35°, a contraction at 86°, and a second expansion at 125°, corresponding with the three transition-points of the four modifications of the nitrate. Potassium nitrate undergoes an abrupt expansion at 127°, rubidium nitrate at 161°, caesium nitrate at 148°, and thallium nitrate at 73° and 142° C.

IN reference to Dr. Baker's remarks on the Theory of Numbers at the Sheffield meeting of the British Association (NATURE, October 20, p. 514), Dr. Vacca, of Genoa, sends us the following quotation from Euler (Nov. Comm. Petr., vol. xvii., 1772, p. 25):—

"Non dubito fore perosque, qui mirabuntur, me in huiusmodi questionibus evolvendis, quas nunc quidem summi geometrae aversari videntur, operam consumere; verum equidem fateri cogor, me ex huiusmodi investigationibus tantumdem fere voluptatis capere, quam ex profundissimis geometriae sublimioris speculationibus. Ac si plurimum studii et laboris impendi in quaestionibus gravioribus evolvendis, huiusmodi variatio argumenti quamdam mihi haud ingratam delectationem affere solet."

WE learn from the *Engineer* for November 11 that the Metropolitan Water Board intend to instal a battery of Humphrey gas pumps for the reservoir which is being constructed in the Lea Valley, near Chingford. A total pumping capacity of not fewer than 180 millions of gallons in twenty-four hours is required, made up of one unit of 20 and four units each of 40 million of gallons. It is understood that the Pump and Power Company, Ltd., offered to supply and erect on foundations provided by the Board five pumps of these capacities, together with a Dowson producer gas plant and all accessories, including two electrically driven compressors for starting purposes, for the sum of 19,388*l*. The guaranteed fuel consumption is not to exceed 1.1 lb. of anthracite coal fed into the producers per actual horse-power hour when working at the normal full load during an official trial of six hours' duration. The head to be pumped against is 29 to 30 feet, including friction. Thus a power of about 250 pump horse-power is required in each of the larger units. The conditions are ideal for the Humphrey gas pump, but as the power is larger than anything yet attempted by Mr. Humphrey, the results of the experiment will be awaited with considerable interest. At any rate, the Water Board cannot be accused of being behind the times.

AN article in the *Builder* for November 12 deals with a novel type of timber construction evolved by Mr. Otto Hetzer, of Weinar. In this new method the cross-sections of timber beams are adapted to actual stresses as in the case of riveted iron structures, and this is carried out by means of a composite beam with variable cross-sections in each given portion. A special glue being required, capable of forming an inseparable whole out of a number of composite parts, Mr. Hetzer seems to have succeeded, after many years of work, in producing one which possesses the required rapidity of binding, resistance against atmospheric influences, and the property of increasing hardening. The Hetzer compound beams are composed of three longitudinal layers, the uppermost of which is a wood characterised by a particularly high compressive strength (such as red beech), and the lowermost of a wood of great tractive strength (such as pine); the central portion need not be of any specially resisting material. An upward parabolic curvature is imparted to the central wood, so that in the central cross-section, submitted to the highest stresses, the whole of the deflection thrust is dealt with by this parabolic core and the lowermost layer. Satisfactory tests of these beams have been made at the Institute of Charlotten-

burg. Photographs of a bridge and several large roofs constructed under Hetzer's system are included in the article.

ONE of the chapters in the latest volume of "The Cambridge Modern History" (to be published on December 8), dealing with "The Scientific Age," is written by Mr. W. C. D. Whetham, F.R.S., who has undertaken the important and difficult task of surveying the trend of modern science in all its various departments. In this chapter will be found considerations of the Darwinian hypothesis, of evolution and religion, of electrical invention, of bacteriological treatment of disease, and other phases of modern scientific progress.

THE October issue of *The Central*, the organ of the Old Students' Association of the City and Guilds of London Central Technical College, maintains the high standard previously reached by this periodical. The number is well illustrated, the frontispiece being an excellently reproduced portrait of Prof. W. J. Pope, F.R.S. Among articles contained in this issue may be mentioned those by Mr. H. Clifford Armstrong on steel making; Messrs. W. Gore and D. Halton Thomson on rainfall, steam-flow, evaporation, and reservoir capacity; Mr. Howard Mayes on boiler management; and Mr. A. G. T. Glaisby on birds and photography.

#### OUR ASTRONOMICAL COLUMN.

DISCOVERY OF A COMET.—A telegram from the Kiel Centralstelle announces the discovery of a new comet by Dr. Cerulli on November 9. Its position at 8h. 20.8m. (Rome M.T.) was R.A.=3h. 38m. 36s., dec.=8° 43' 20" N., and its daily motion amounted to -8s., -19'. The magnitude is given as 10.2, and the comet's position lays about half-way between, but slightly below the line joining,  $\zeta$  and  $\lambda$  Tauri.

METCALF'S COMET (1910b).—Dr. Ebell publishes a continuation of his ephemeris for comet 1910b in No. 4452 of the *Astronomische Nachrichten*. This ephemeris covers the period November 13 to January 4, and shows that the comet is now moving slowly, in a north-easterly direction, through Serpens towards Corona; on December 8 it will be about  $\frac{1}{2}^{\circ}$  north of  $\delta$  Coronæ, and of the twelfth magnitude.

RECENT FIREBALLS.—A large number of fireballs have been observed during the last few weeks. The records of their appearance are not, however, sufficiently full and accurate to enable their real paths to be computed except in the cases where the objects were seen by capable observers.

The majority of the brilliant meteors have evidently belonged to a shower of Taurids, which is often very active in the first half of November, and is notable for the magnitude and conspicuous aspect of its members.

At 10h. 24m., November 9, one of the most interesting of the fine meteors recently seen was not a Taurid, but directed from a radiant at  $312^{\circ}+11^{\circ}$  in the western sky. It passed from over a point east of Yeovil to west of Horsham at heights of 62 to 32 miles. The motion was unusually slow, viz. about 12 miles per second. The meteor sailed through the air in an apparently serpentine course, its sluggish, wriggling flight being specially noticed by observers at Bristol and other places, who mention it as quite an exceptional feature. There is no known shower at  $312^{\circ}+11^{\circ}$  in November, but on November 2, 1801, Mr. Denning recorded a brilliant meteor close to its radiant, estimated at  $311^{\circ}+11^{\circ}$ .

SOLAR ACTIVITY AND TERRESTRIAL TEMPERATURES.—An important paper on the effect of solar changes on terrestrial temperatures is published by Mr. W. J. Humphreys in No. 2, vol. xxxii., of the *Astrophysical Journal*.

Mr. Humphreys accepts the interrelation of magnetic, and auroral, disturbances and sun-spot changes as established, and points out that terrestrial temperatures and

rainfall are observed with sufficient accuracy to justify an examination of their relation to solar activity. Further, he considers rainfall dependent upon temperature, which is more accurately measurable, and so considers only the latter.

Taking Abbot and Fowle's conclusion that sun-spot maxima are accompanied by terrestrial temperature minima, and *vice versa*, the average range being  $1^{\circ}$  C., he points out the practical importance of a fuller knowledge of the nexus between these phenomena.

His conclusions, stated briefly, are that at spot maxima the solar atmosphere is more fully charged with "dust" (i.e. any particles capable of reflecting and scattering light), and therefore, owing to selective absorption, the proportion of ultra-violet radiations finally escaping will be diminished. Ultra-violet radiations acting on cold, dry oxygen, such as exists in the earth's upper atmosphere, produce ozone, therefore at spot maxima the amount of ozone will be less.

Further, it has been shown that ozone absorbs a much greater proportion of the earth-reflected radiations than of the incident solar radiations. Thus at spot maxima, with less ozone, more heat will escape, and a lower temperature ensue; the converse explains the observed rise of temperature at spot minima.

This process is complicated by many factors, such as the increase of ozone-producing auroræ at spot maxima, but Mr. Humphreys suggests that the observed change in terrestrial temperatures may depend largely, if not wholly, upon the selective absorption of the direct solar and the terrestrially reflected thermal radiations by the changeable amount of ozone in our upper atmosphere.

STARS HAVING PECULIAR SPECTRA, AND NEW VARIABLE STARS.—Circulars 158 and 159 of the Harvard College Observatory contains lists of newly discovered variable stars and stars having peculiar spectra. In No. 158 thirty-eight new variables, chiefly discovered by Mrs. Fleming, are tabulated, and there is also a list giving the positions, magnitudes, &c., of nineteen stars of which the spectra exhibit various peculiarities. Ten of these are of type vi., three are of type v. with bright lines, four are gaseous nebulae, and in the remaining two H $\beta$  is bright. In the spectrum of the ninth-magnitude star DM.-14° 5265 the bright line appears to be of slightly greater wave-length than H $\beta$ , but is not the 5007 nebula line, and on a later photograph there is a trace of a bright line on the less refrangible edge of the dark H $\beta$ ; it is suggested that in this spectrum the bright line may be variable.

No. 159 contains a list of fifteen new variables discovered on Nos. 7, 10, 16, and 19 of the Harvard Map, and the usual analytical table shows that 0.41 of the probable variables on map 19 yet remain to be discovered. It is also stated that the very red star +46° 1817 apparently varies very irregularly.

THE DISCOVERY OF NEPTUNE.—No. 1954 of *La Nature* contains the complete text of the letter in which Leverrier sent to Dr. Galle the results which led to the visual discovery of Neptune. It is stated that the first time the whole of this historic document has been published is in a recent article by Dr. See in *Popular Astronomy*, and it is suggested that the proper place for the original would be in the museum of the Paris Observatory.

VARIABLE STARS IN THE ORION NEBULA.—No. 4451 of the *Astronomische Nachrichten* contains a list of eleven more stars, in the nebula of Orion, which are apparently variable. The number of known variables in this nebula now amounts to 156.

#### THE BANQUET TO JUBILEE PAST-PRESIDENTS OF THE CHEMICAL SOCIETY.

THE council and fellows of the Chemical Society honoured five of their past-presidents who had completed their jubilee as fellows by entertaining them at a banquet at the Savoy Hotel on Friday, November 11. A large gathering numbering 250, including the Duke of Northumberland, the Postmaster-General, the presidents of the French and German Chemical Societies, and no fewer than eleven past-presidents, was presided over by Prof. Harold B. Dixon, F.R.S., the president.